MARK LABELL: So my name's Mark LaBell, I'm Senior VDC Technical Leader. I'm going to pace and run into this table a lot today because they didn't give me any room. What that role means at SSOE for me is-- it's a fancy title, it sounds really awesome-- but my day-to-day operations is helping team members, helping project people get new workflows in the works.

So we work with those project teams, integrate them, then I get the hell out of the way, let the project team do the thing. So I'm not the corporate standards bearer, just an enabler more than anything. And Tony you want to give yourself a quick introduction?

TONY PAUPERT: Tony Paupert. I am now more mixed in the projects, Project Section Manager for the VDC group. Doing day-to-day more or less overseeing the projects, being the front line to oversee and get the coordinators and specialists as we call them to adopt the same practices and do the same things so our projects have a good head start going in. So that team is key.

MARK LABELL: All right so Tony's going be helping me when we get to the live demo portion. I have about a half an hour of slides. Give some anecdotal evidence, stuff we've done on projects, stuff maybe we've not done so well, help share some lessons learned that we've done. So everybody ready for that?

AUDIENCE: Yes.

MARK LABELL: There we go. That's what I'm talking about. Got to feel the love. One the other thing, we like to run this a little non-traditionally. We do have time budgeted for questions at the end. If you've got a burning desire, a question you want answered when you see something, ask it, OK? That does help us gauge where you guys are in the room, what you want from an informational standpoint.

And we can kind of tweak it. It's not like we're going to tweak our entire presentation for you, but you know, if you got something fire it up our way, OK?

All right. So as we'd mentioned we both work at SSOE group. Tony is out of our Troy, Michigan office, I'm out of Toledo, Ohio. But I want to show you a little bit of how we work so you can understand why we work with the data as we go further into the presentation. We are a large organization, we are on seven different countries.

We do work to chase the sun on some of our projects so it's kind of a, as the sun goes one

way we continuously keep working. So when we talk about point cloud data we can't just have it in a single office. It needs to be throughout our entire environment so that people can see that data fast and be able to do reliable work, or else you know what happens when people don't see point clouds. They do things the incorrect way, and things go bad really quickly.

Another thing about SSOE group is we do a lot of our work in manufacturing, so the examples you're going to see today more manufacturing-based than maybe if you're in the health care, the commercial, side. But kind of the idea still resonates with you. So think about how it would work for you. If you're in civil and you're in the land side a little bit more, you know, same type of practice we're showing you, but obviously our focus is in much of that heavy industry.

A lot of the buildings, or our clients are people that do produce the cars that you drive to and from here-- the materials that make the buildings, the food that you feed to your pets or yourself, cereal-- that's what we do. You know, computers, that's our clients is the people that do that type of work.

Also the standard of care that we do is we exhibit that we want the highest quality deliverables to our clients. So as part of our standard of care is doing not just engineering and architecture work and startup, but we also do procurement and construction management as well. So not every job we do run that way. So once again, these are some of the ways that you're going to see that's kind of the reason why we've pushed it this way.

Upfront apologies, as I said I'm an excitable guy. I'm very passionate about this, all right. I do tend to rub people the wrong way on the Scan to BIM stuff. Don't get up right away, hear me out please, OK? I'm pleaing with everybody here that I know, as an industry we can do much better with how we treat point cloud data, reality capture data, whatever you may want to call it-- that flavor of the week word-- we can do much better with it.

So don't everybody go start rioting because you're not happy with how the polls went. You know, got to get a little humor in here. So I'm apologizing, you know. Point clouds are my passion. I've spent a lot of time over the past couple of years working on them, lot of investment. So don't mean to offend you, but if you don't like it just let's stick around and hopefully I'll convert you in the end or at least get you to think a different way.

So we are a very lean organization, or we try to be lean on several of our projects. And anybody want to try and define lean? Not talking about your goals after the 1st of January

after everybody eats on Thanksgiving. Anybody want to give a crack? One happy person in the back.

AUDIENCE: [INAUDIBLE]

MARK LABELL: There you go. It's really simple. I mean, lean.org, it's pretty much that. You know, it means creating value, aligning your goals with your client, not just trying to be a profit center and make tons of money. But a lot of times as AEs, we keep on trying to hammer the same big box of shit into a square hole. Sorry, I'm very passionate as I said.

So talk with your clients, understand your client's goals, adapt your workflow and processes to them. That is truly lean.

So a little bit of story time. This helps understand why we are the way we are, what we're going to present later on. So our first project, when we actually started doing Laser Scan, started way back in 2008-- business leaders over there on the left, I'm on the right. My artwork is really awesome, by the way. I'm good with point clouds, I have third grade-- I think my five-year-old daughter draws better than me now.

So he comes up to me, he says, hey, we got a project we want to scan-- technology guy. Awesome, let's do it, sounds great. Didn't have a plan. We'll talk about that in a moment. So I get excited.

Yay, we're going to do this. Awesome, we really didn't plan it very well. They scanned it. Data's too large, 2008. Anybody work with point clouds in 2008? Anybody not agree with that statement? We had to buy a supercomputer just to be able to view the data about 10 to 12 grand investment. But when you have 10, 12 people on the project you can't buy 10, 12 computers with no forethought and no plan. So you can imagine where that went.

A ticked off a business leader, after five weeks, hey, we had to go scan to BIM, because in 2008 that really was the gold standard. I mean that was the only way to really look at point cloud data is you had your real views or your picture views maybe, and then you had to just convert the minimalist model stuff to work with the data.

So we did that. It put a little bit of a hurt on our schedule. End of the day, client was still happy. They were able to immerse ourselves into the facility that they weren't intimately at. That's a big thing, but we could have done better.

We did lose a little bit of money, but happy client, good relationship. Overall not bad.

Early 2010, you think that two years later we might have had a better plan in process, but project manager there on the left, I'm on the right. The project manager walks up to my desk-- I'll never forget this snowy day in January-- 30% due by the end of the week. Here's a hard drive full of data.

Talk about a plan there. Anybody ever have a hard drive just show up magically at their desk? No? One, two. OK. Yeah, that was awesome, by the way. You can imagine that was my response.

Did we get something together? Yes. It took seven people, seven highly technical staff members three days to cobble up the biggest pile of crap that still made them happy, but seven people plus the design team that still had to get the documentation out. So very bad planning.

Early 2013, things are getting better, you know, we're starting to involve it a little bit more. I'm on the left, C-suite's on the right. We now understand that where we are in the industry things have caught up, and they become a little bit more mainstream. Scanning is becoming more democratized-- I know that's an Autodesk word there-- but, you know, it's becoming more accessible, it's becoming cheaper, hardware is more readily available, it's starting to actually go directly into our suite of programs.

So we have a small project, very tight spacing, trying to get pipes from one end of a plant to another. And it was a great job, because it was just basically chase the pipe rack down and make sure that you know-- scan it. One day of scanning. Very small cost. $2,500 just to scan that job. It is an easy job.

C-suite still said no. $2,500. Now think about this, we're going to send engineers in the field with tape measures and put them in a scissor lift. It's not very safe behavior, and probably going to take longer than $2,500 hours of fieldwork. But this is tried-and-true method, remember. Everybody still knows how to grab a tape measure and rely on that data.

It's worked for 30, 40, 50, 60 years. Why do I need to trust the tech group? The first two projects that we had in eight and 10 weren't so great. We remember that. Now we've had some success on other jobs where clients drove the process, but they still didn't believe we can actually do it as a non-driven thing from our client.

Ended up we paid for it out of our department, went well. We learned a lot of things from that. So then the general manager of construction-- I don't think he actually joined me today. I'm looking around the room, he said he's going to be here.

He's a great guy to have on your side. He doesn't actually lay back ever in his desk like that, but it's just fun to put that there right, you know. And he calls me-- I remember, this was right before I had my youngest daughter-- says you know we want a scan of this project. We owned it. You know, this is a [? CM ?] at risk job. This is our job to screw up. We don't want to screw it up obviously, but we want to scan it.

Now we've obviously had some successes, we have people on bigger jobs that know how to work with the data, but we don't have quite enough people at SSOE now that are trained to work on the additional influx that we're going to take on. So I actually fired back and said for once, we're going to actually hold on this one because we don't have enough people. Nothing worse than going to spend 20, 25 grand on scanning a job you don't use the data.

That's bad. You know, client's going to throw egg at you, you're not going to get a good relationship. So we ended up just doing it traditionally, which turned out to be kind of a bad thing because 70-year-old facility, how many of those are really built to the as-builts if you can even find them. Anybody want to take a guess?

Those columns were two feet off which is bad. You would never think structures that far off but in the 100 plus jobs we've scanned in the past two years I can probably tell you on 25% of the jobs, we're getting two to four-foot busts on columns on these facilities. It's crazy. You would never think that.

Two-foot bust, they started pre-fabbing all the steel for the structure, for the equipment. We ended up losing $200,000 out of our profit because of that, because of that one simple mistake. Now everybody knows the saying about the flavor of bad quality and such. Well this wasn't bad quality, we just lost on this one.

But from a construction management side, we still procured and bought out packages and still got everything installed turned up and compressed the schedule by several weeks. Anytime you can turn a product line on several weeks earlier means they're making product faster, which means they're making money. They're happy still.

So like the previous story in 2008, we still got a happy client, we just lost money again. We

don't like losing money. I don't think anybody in the room likes losing money I'm pretty sure.

So what happened there was quite possibly the best thing we could have ever done for scanning at that point. The GM realized he wanted to do it. We weren't quite trained well enough. We lost money because of that. He changed the mind of the C-suite, and this is what happened in 2014-- and this is no joke.

So 2014, the water, the hose turned up. And it's not just me, there are plenty of people that do this. Tony has worked with this from a Revit standpoint. We have plant people that are invested in this, plenty of other scanning people that work with this. And by scanning at SSOE, we don't own a scanner.

This is a completely vendor network. I can call up vendors whenever I need them, they have as many scanners as I need to get jobs done as fast as possible. We've scanned 1.5 million square feet in less than four weeks. 2,200 scan positions, I believe, using [? survey traverse ?]

So present day, where we're at today, I put the Oprah thing in here because it's true. It's just like her show. You get a scan, get a scan, get a scan. Two weeks before I came here, no lie, seven proposals we wrote up for scanning. None of them less than $20,000 scanning PO cost. I mean that's a relatively big job in terms of scanning, and when we scan we only get the data.

We don't care about anything else. You scan it, give me the raw data, and we'll walk through that process here in a moment.

So anecdotally, and this is where I come off a bit brash. Just listen to the evidence of the most important man, because in '14 we also converted 700,000 square feet of a manufacturing facility in Scan to BIM. It took months to do, and it helped us with coordination mildly. But if we would've just learned to work with a point cloud data, once again, would have saved money.

And we were using automation tools that you'll see in a little bit. So that's why we say this.

So project example. This is a particular project where we gained a relationship with a client. You know, you start doing small work, that's how client relationships go. You get the trust, you start getting bigger work.

So project number one, you know, we go in and they're going to tell us what to do because we don't have quite the relationship yet have to say, we're going to change your game for you. So, short project, very low cost, issue for constructions, very tight deadline. I mean everybody

deals with this. These are things that we know happen on our job.

The thing that was really a pain in the rear from a goal standpoint is we had to stick to their CAD standards which-- CAD standards. Does CAD standards really-- can anybody argue this-- Does CAD standards really make a project more successful in terms of construction?

OK. I'm glad the room agrees with me on that one. So what we knew when we went into the project, obviously, like we said, schedule driven. OK, good. DOT work. So they have a deliverable that the government needs to have at the end of the day that matches that look and feel.

That these facilities, all of it's scanned TIFF files. You know, Mylar, onion skin. Some of it's been converted to CAD, some of it's mismatched. They're using Raster Design to overlay CAD on hand drawings. It's a frickin' mess, OK? And the drawings aren't updated like anything else we've already dealt with.

You go in the field, you know, there's 10 pipes that are either missing, that aren't in the drawings or vice versa. There's 10 more pipes that just shouldn't be there.

So the client direction. We want it to look like a TIFF, once again going back into the smashing the turd into the box. Some of the 3D design was done in MicroStation. We do MicroStation in-house as well. We're not just an Autodesk firm. Whatever our clients tell us to work in, we got to work in it. I mean, at the end of the day, like everybody in this room, if you're going to get paid for something you're usually going to try to figure it out if they're going to tell you to do that.

And bills of material. So this is the piping example, more heavy process piping. All the build materials hand calculated and counted from the 2D drawings, because once again we're looking at TIFFs and all that stuff.

And then to make the job even crazier we were the engineer on that job. There is your typical GC role, and then the client purchased everything less than two inches. So they still needed to detail it and understand it, but then they purchased it. So it really knew the contracting very hard.

So uncovered. Kind of already said this, but we had TIFFs. Of course they're rotated, because when they scan them in anybody that remembers scanning TIFFs they start twisting in the scanner. The scales get all jacked up. So even if you bring it into Raster CAD things get really

kind of squirrely quickly.

Line continuations from piping didn't match from one sheet to the other. Even though it said go to sheet two for the continuation, sheet two didn't show the pipe. Awesome. It really makes it a good deliverable set when you're trying to take it off for estimating or actually building the place.

No typical details or consistent material specs, which no consistent material specs and anybody in the plant and piping world makes it kind of hard. Plus the design level of detail was completely outdated so a lot of people in the office were much like the "Y you no like me" meme, and very frustrated because it was very hard to adapt to what we normally do as an industry-- a very cut and dry design, deliver, very detailed documents, easy information and then hand it off. It was very, complex.

So this is one of the example drawings that we dealt with it. It looks pretty good, huh. Anybody be able to build off of that? Any contractors in the room by the way? You really think you want to tie 10% bid to that? Do you feel comfortable with that, especially when you can't read the right hand side of that screen there?

So you can see the clouded work over there on the left. That was our new scope of work. That was our design, by the way. You had read that too. Now luckily there was a sheet that had a blow up detail so the guys that raised their hand again, you feel comfortable 10% getting close? Of course you're going to pad your bid, and that's the standard of how they run all their jobs.

I mean that's just how they work. I mean, most companies still run like this, most clients. And this is why we didn't inform them right away. We wanted to work with them. Now here was a detail. We still detailed it in 3D and then we had to smash it down into 2D and get it back in Raster CAD. So still high level of detail. This was a lot better for you, but not an easy process to put all the dots together.

So project one made money. Everything was OK, but way too painful. So never forget the phone call on this one as well. Myself and a couple other technology people were called into a room with the project engineer, and he said how can we change the deliverable strategy. We've been given projects two and three. They're not even going to bid it out. We did good enough on project one, which that's the goal of every job, right?

You don't want to be bid against your competition on the next job because you want to be able to get handed work. We've achieved that now, and they gave us jobs two and three right away instead of phasing them out. So it was like, all right, we get more work and faster. how do we get better, because we can't do the same thing again.

So here's an example of once again what you're looking at from project one. You have your CAD there that was detailed out, and then you have your Raster overlay that we had to give out for bidding. How do we match-- remember the project goal, client deliverable. They want that look and feel still, and that's what they are giving for bids.

How do we match that, but we don't need to give that to bids any more. We're going to give them a real design set, an actual set of drawings that looks like you would normally do. All new stuff, some existing modeling, bills of materials that are accurate, not hand-counted. And something that you can actually build with confidence, not looking at these crazy rasterized drawings.

So our pitch was, we're going to give you your as-built, you know, DOT-regulated files, but after construction's done. We're not even worry ever about doing that. That was a kind of a radical mindset. Took a lot of conversations with that client to get there.

So the new process was scan every site. And by the way, each of these projects has about five or six different job sites that you have to do, so when we say two projects there's 10 sites, 12 sites. So a lot a lot of work. Highly agile team, constantly doing work processing.

We model it in 3D, we have our ISOs generated from the 3D model, bills of materials all automated. Obviously, it makes sense. Most of the room I don't have to argue this why we do this anymore. Eight years ago at Autodesk University we would have been talking about how awesome this is, but now we're in a better place.

And then when it came to construction documents bids we were still given a 2D drawing package like you normally would, and that TIFF is as part of that as-built process once again. So as you can see here in the upper right there's a scan of the facility. Here's our new equipment skid with the piping going directly to that.

Notice that we didn't do Scan to BIM on there. There's the point cloud and we designed right to it. So for a refresher here's the original drawing that we delivered. This was our proof of concept to get the client to buy in. There's the same 3D model. Now we didn't detail all the

dimensions, because we told them we'll dimension it, but are you OK with that? Looks the exact same.

They were happy with that. So kind of summarize how those two projects went. Project one is on the top right now. We'll bring up project two.

So scope definition within the organization, you know, getting our team aligned. That's the first thing you always do on a project, hopefully. We do a drawing request, so we would actually request all the drawings. And that process, as you can see, spans past 30% review.

We don't even have their drawings at 30% review on project one. I forgot to mention that actually. That made it even trickier. So at 30% review we're going in with napkin sketches and PDF redlines. Imagine what your project's going to look like.

That was the process. So then you get your drawings received right before 60%, then you try to jam all of your napkin sketches into 2D drawings that look like garbage already. Nothing really reflected it so you're still going to 60% with napkin sketches, still a lot of uncertainty.

Contractors on board at that point. They're already starting to prep what their estimation is going to be off of 60% design from napkin sketches. Not easy. Can be done, but very time intensive. Then you go through your 90% and it was bid phase off of those documents.

Rewriting the playbook on the bottom. We would scan it, we would get the data. So they you're scanning the sites, it'd take about four days. We would walk off-site on Thursday, we would have the scan date in-house on Monday and working it on Tuesday in Navisworks and Plant 3D.

It's pretty remarkable turn around, because they scanned it. We still haven't even requested drawings yet, and we're already doing our design modeling in 3D. So huge game-changer. We're ahead of the curve actually on the job.

We're actually doing 30% design reviews with the client fully immersed in their site, which by the way, like I said, all these sites, they're spread all throughout the country. It's not like they're all within driving distance of where they're at.

Just like any of us, very immobilized workforce. They never get to see these sites. That was a huge advantage, because now they don't have to fly to all the sites and do walk-downs all the

time because they were doing walk-downs at every review.

So we'd still keep the walk-down at 60% where we'd go there but we would also do a model review with that. And then same thing through 90%, but we were also giving these drawings-- we were taking screen shots, and we'll show that here in a moment-- to the contractors for very critical pieces of information. long-lead items for equipment, long-lead items for special pieces of pipe that take longer to get in.

So a much different set of documentation is part of that process. How are we looking on time? OK, good. So here's the initial scan of that particular site. You can see all the pieces of equipment that we went through and demoed. Of course the middle swath, all that equipment's gone.

What is hard to see based on the projector here-- it looks a lot better on a high-res monitors. On the left-hand side the piping's missing. The top of the piping's missing, and you can see here on the right if we tumbled it, the piping's missing there.

So we've cut that all out of our model, no longer there. Why do we do that? Well, one, you don't have to worry about doing in Clash Detection on piping that's not there when you know you're going to demo it. Two, it makes it easier for the person that's actually going to do it from the modeling perspective, and know what space they have.

So once again as we had stated before we do a little bit of Scan to BIM. The green pipes there are showing the existing connections. You do need that in your drawings for ISOs and other reference material. So we do spend a little bit of time tracing those things, but once again, we're not doing the whole thing. Very specified.

Also when we hand these models over-- because with this client we also added the models over to them. Everything, full transparency now. And they're extremely excited about this. We let them know that anything that's in an existing model-- this is important, so any of you that try this method make sure you document this-- existing models don't use that for dimensioning when you're going into construction.

The point cloud is the gospel. That's the most accurate thing, OK? Don't use the existing, because we've had one or two that came back and said, well you modeled it, that mean it's the thing we're supposed to dimension off of. No, use the point cloud. The column is in the right spot.

You can't completely model columns 100% accurate. They have twists, they have flange bends, forklifts, any of that stuff hits them.

So here's our new design. Once again, that piece of equipment, just a little bit different view of what we're looking at. And here's some of our deliverables now in 2D format. So much more detailed than what you saw before. A pretty similar piece of equipment, but you have your ISOs, your one-lines, your build materials. All of that, once again, is completely automated. We don't talk about too much of the praise of that.

Here's some of the construction reports as we did as part of that. So not only do we give a traditional bid package out to the contractors on this job, we went in gave them an additional step. Here's those critical pieces of equipment. We threw this in.

We're using a plug-in called iConstruct for Navisworks to do these views. Put in these comments and then we send that out as part of the additional bid package. So they have better information of what's there. You know, what's the critical piece. You know we know that from an engineering standpoint, but they don't know that yet because they may not have been in the game completely.

Just another view with another kind of overlook of that. And just a different part of that. Once again, you can see there the green pipes re-tied into the existing, all the white pipes and the valves, all brand new work.

And this is how we modeled them. We were cutting our 2D views from them. What's the question?

AUDIENCE: [INAUDIBLE]

MARK LABELL: This particular job, no. The point clouds don't show in 2D The workflow that we're going to pull up later, yeah. We are putting point clouds in 2D. So that's actually the workflow. Were going to show that specifically with Revit, but we can do it with Plant as well. It requires a little bit of trickery. It's not easy.

So from a case-study standpoint and the successes on this job, we were able to do the same, or actually more work with less people. And it's not like we said, OK, we got two, three less people to do the jobs so we're going to fire the. No, we put them on the other job that we want as a part of this.

So we were able to take it on and say, no, we can't do that type of thing. Provided much clearer construction documents. The bids were coming in tighter than that client has ever experienced before, because the package was much more complete and not just looking at old hand-drawn sketches basically.

And of course at the end we still met their deliverable, their client requirement, the look and feel that they still needed at when it went to as-built.

Another case study. This is more of the materials that you're going to see, the particular project that we're going to break up here in the live demo in a moment. This job we ended up winning it because we came in with an aggressive schedule. We're going to basically reduce it by five months. That's big when you can do that on a particular job.

They had it drawn out as kind of weird, but we showed how we can help provide value in that process. We, from a demolition standpoint, using that demo process, 14 RFIs and 400,000 square feet of retrofit.

14. Three of which related to structure that wasn't built to any AISC manual, so they had, of course-- you know, that's going to happen.

New construction's still going on so I can't give you an RFI in totality there to say, is it trending lower, better. But we know it's there, but just is it, you know, what orders of magnitude.

But from a VDC BIM person in the room here. I'm not sure how many there are. Actually let's do a show of hands. How many [? have been? ?] 15%.

All you guys do Clash Detection? Do you guys love Clash Detection, especially all the ones that are false? Nobody's shaking their head on that one, right? By doing demolition point clouds. Now it might seem crazy that you're going to spend time in trace where you're going to demo stuff out, 50%.

So when you're getting in 400,000 square feet, this just the particular area we'll show it a little bit, you'll get maybe about 800. We were getting almost 2000 clashes per area, and each area was, let's say about 40,000-60,000 square feet. So that's a lot of just BS that you're cutting out of your daily job. So that's a big deal there.

So it might seem like you're expending a lot of effort to do this at first, but there are a lot of other benefits. Obviously clear documentation, highly accurate deliverables, but also the

benefit to you as what your job role may be or somebody else in your organization.

What in the devil did I just do? OK, there we go.

One last case study. So this is one that we actually did a full Scan to BIM on. So like I said I'm not completely against it, but once again, do it where it makes sense. This particular job, 50, 60-year-old piping, completely corroding, sagging, twisting, bad shape. Cut it off at the walls, and basically replace it. That was the scope of the job.

We want the same exact thing that's already there, don't need to re-engineer it, but you know, we want to also be able to prefab it and bring it in. So they're going to put 80 hours of field work to measure everything, document it, get all the valves, take all that information. They spent six hours total using a hand scanner. Three of it was in a car, and they scanned it twice just for good measure.

74 hours saved just by scanning it. We use that time to train that person in Plant 3D, they had not used it before. Brand new engineer to the organization. So we use that as a benefit saying, OK, this job was originally going to be done in 2D much like the other job. Hand takeoffs, hand build materials. We weren't even going to do ISOs because it wasn't required.

They just wanted a set of drawings to bid, the contractor was going to hand it all off. So on this job we did a fully detailed 3D model. We had all the ISOs build materials. We still saved them 100 hours on a time and material budget, and we saved them additional money on the contractor not doing all the detailing as well, which of course awards us more work. And you know, it's a good thing.

So here on the right-hand side the reason the cloud looks so weird with the colors is because we've overlaid the 3D model directly on top of the hand scanner data. And of course anybody that's used a hand scanner, it's photometric, or light sensitive. It's not quite as good as what you're looking at in LIDAR. So it does have a little bit of a weird ghosting effect. Yes, question.

AUDIENCE: [INAUDIBLE]

MARK LABELL: Right, thank you.

AUDIENCE: [INAUDIBLE]

MARK LABELL: It depends on what we model, and we don't determine that until we walk through the process.

AUDIENCE: [INAUDIBLE]

MARK LABELL: Yeah, the guy that learned this for the first time and you know, mind you, we had Qubit. We don't even use Qubit anymore because of the integration of-- this was done in Plant 3D, 2016. Some of the new nodal snap features, he used it in there. I mean, he was learning how to use the program, but within I think five days, he had it pretty close to buttoned up in terms of all the XYZ location. But that's with the learning curve too.

I mean he's a he's a pretty intelligent kid, he caught on really fast so.

AUDIENCE: [INAUDIBLE]

MARK LABELL: Yeah. Yeah. So any other questions? OK. So what changed, why did we take the approach that we did in the industry? Solid state drives. Huge, improvement to what we deal. Without those bad boys we would not be able to process the data that we do.

And one of the things that you'll see here in a moment is we replicate all of our data across all of our offices in the US meaning from a point cloud standpoint, we have about four terabytes, roughly, of active project data that replicates between all of our offices. That's a hell of a problem, by the way. It's not easy to do. We won't talk about that because I can spend two, three hours just talking about what not to do.

Now what we do is localize the data so yes, it's replicated to every office, bit now it's replicated to the user's workstation. But replication is not the right word, but we'll use it for simplicity here. So if the data is on the network and that person works on project x they have the ability to pull it down, and that's huge performance impact.

We're talking one terabyte drives in over 200 people's machines at SSOE, and we'll have a return on investment in a month. We have the proven data behind that. One month for one terabyte drive.

Also what happened is recap, big game changer for us and as well as everybody. We're able to get the data directly into our Autodesk software. We weren't using something crazy like a-- I can't remember the Cyclone product or something else. That made it a lot easier to integrate directly within there, so those two things.

And if you look at the time frames of when both of those came out that's right around 2013 when we started pushing things because we realized at that point the software was there and the hardware was there to be able to complement how we work as an organization.

So what do we use from an application standpoint? Now across the top is, let's call it our typical workflow-- 90% to 95% of our jobs we're using Navisworks, we're using Plant 3D, we use Revit, it we use Inventor, we use Civil 3D, pretty much everything, OK, at that point.

We are a large organization, and we have a lot of different business units that do different design features. So not every job uses all those soft-wares, but I can tell you right now we have a lot of jobs that do use Revit, Plant 3-D, Navisworks, and ReCap. That's very common at SSOE and it's not easy to do. And of course there some of the others.

Lessons learned. Of course you can see 2014 across the bottom in yellow and then the teal and the blue. 2015, 2016. We spent a lot of time getting people to be able to train it in the modeling software. Biggest bang for the buck obviously, right away. What we found, profoundly, is if you don't engage the engineers to look at the point cloud data and train them on how to use ReCap software, guess what they're going to do? Anybody want to guess?

They're going to go back in the field and measure, which is going to be lost time, lost money. You know, a huge waste especially, I mean, a lot of the field work we do, not really within driving distance of an office.

AUDIENCE: [INAUDIBLE]

MARK LABELL: Oh, yeah.

AUDIENCE: [INAUDIBLE]

MARK LABELL: Yeah, so what happened in 2015, as you can see on the right there, point cloud viewing. That's your engineers, that's your project managers, stakeholders, estimators, basically not your modeling staff. What we would do when a project kicked off hour-and-a-half required training if they had scans involved in that job.

I don't care if you're never going to look at it because you're an instrumentation guy you're sitting through the training, because you probably will use it at some point on the job. And we do go through those tools of Pipe Snap. And yes, some of the tools early on with the ReCap

team, that confidence wasn't there. Now there's a very contextual-- and obviously with JetStream it's gotten better as well.

You know, the confidence is there, but the first couple of jobs, you. You got a guy who's been there for 30 years or a female that's been there for 30 years, I don't trust it. Rightfully so. It's hard to change everybody's mind. Yep.

AUDIENCE: [INAUDIBLE]

MARK LABELL: So we have a vendor network, they're required to do that. So most of them-- not to sound biased towards a product-- but all of our vendors use Leica equipment. Kind of hard to say not biased, so they're required to do other registration. They do it all on Cyclone.

So we had to, of course, as we've gotten more proficient we've developed custom apps. On the left-hand side there you see our application that actually copies down and monitors all the projects. So it's not just like your copying the data. If you change project from project x to Project y you can copy the next one, and if somebody adds new data to it, it alerts you right away. Full-alert system.

And then on the right-hand side, yes, that's ReCap, but all of those tags are column markers. So you can just plug in a column grid, say where you're starting at. Column A-1, you're going all the way to Z-36, tell it the offsets, and bang, all of your columns are offset.

That particular job had 1,200 columns. The application was written in a few short hours and it saved obviously a lot of money. So that's something we use pretty often.

One other thing, based on time I'm going to cut it, is Navis [? to points ?] because we will talk about it. But this is a crazy workflow that we engineered to actually reverse engineer 2D and 3D data in Navisworks to get it back into ReCap so we can actually do our demo process.

And everybody looks so freaking confused that I just said that, so I think we got a good cliffhanger at the moment. And one last thing we'll talk about is, there's a new hack in ReCap. So we unify all of our scan data and we put it into logical sets, and we'll go through that in a moment. But you also have your ReCap project that has all the Real Views associated to it.

So you have two sets of point cloud data, which makes your network storage even bigger. And for us trying to pipe it across the world makes it harder. So what you do here is you delete all

of the points. You can still see the bevels are there. You do a "Save as." OK. Remember this. "Save as."

Now in the handout, I have a link that shows this in more detail. This video is fully narrated, it's a seven minute video so don't worry if you don't capture it all. Then you'll go through the process of importing your unified sets directly to it. Now like I said, this is a hack. It's not 100% supported, so if it does blow up in your face I'm not necessarily at fault and neither is Autodesk.

So you can see here it brings all of that information in there. You've reduced your footprint on the network and or local drives, and it actually operates a lot faster because it's not loading in the individual scan positions. You still have your Real Views there. Voila, life is great.

That just became available not too long ago, by the way. That's a pretty game-changing thing for us. So demo time.

TONY PAUPERT: We're doing good.

MARK LABELL: We good?

TONY PAUPERT: 3:40.

AUDIENCE: [INAUDIBLE]

MARK LABELL: Sure. The ReCap guy just gave me a face that couldn't give me a direct answer. So sure.

TONY PAUPERT: We're actually five minutes early.

MARK LABELL: Five minutes early? Sure we don't have any questions. I can't believe I got through as quickly as I did. I actually added one extra slide 20 minutes before the meeting or presentation here.

AUDIENCE: [INAUDIBLE]

MARK LABELL: This? So in the handout there's a link right on the second or third page that goes directly to my Screencast that's public. And I'm writing an article, and basically I'm going to have a whole step-by-step series of this. And it's completely narrated in detail, so it's not that fast forward thing there.

So every video I'm going to try to keep to about six, seven-minute time frame to walk through the whole process of you receive a file from my scanning company-- raw file format, not a

ReCap project, raw file format, how to import it, what settings you should use. Then this, obviously had to deal with the hack, then how to unify scans, how to break things up using demo.

There's the last slide that I had in there. I was not five minutes early. I knew I forgot something. Whoops. Coordinating coordinates with all platforms. That is a little bit tongue-in-cheek on purpose. Anybody work with all the software like we just mentioned like that? A few of you? Anybody think it's awesome? Coordinating it? I'm getting a lot of no's.

State plane coordinates is still a disaster. It's kind of working a little bit better, but still if you're talking about all the programs tying them together, no. Because Revit, if you get outside that 20-mile limit it's a little flaky still with your video card. Things start getting a little weird with point clouds. It's gotten a little bit better, but there's a lot of hacking. Tony can tell you.

TONY PAUPERT: A lot of arm wrestling with it. You're not going to like it.

MARK LABELL: From an efficiency standpoint, ditch it. State planes, still not there. Plant 3D, as soon as you get outside of a mile, same thing happens. So it's even worse. You can't even get 20 miles away from the origin. You can only get one mile away from origin, which is using state plane doesn't happen often. So what we do as a standard practice, we set a building monument in every job that we scan.

1,000, 1,000, 100 just happens to work out for most sites. I mean, you don't have to choose that, but that's what we set. The point cloud is the gospel. That's the controlling unit, that's your survey. That is the coordination tool. Don't move the point clouds to work in Revit, work in Civil, work in Plant.

Set it there so everything else works. Otherwise you're starting already screw up potentially what is accurate because you're moving a model an 1/8 of an inch or bumping it into place. Set it in your point clouds.

So now our process, live demo. This is where it gets exciting. Any last questions? Sure.

AUDIENCE: [INAUDIBLE]

MARK LABELL: Yeah, Tony will go over that part. We'll also set it sometimes with survey control I mean we'll actually set that out there with Survey Control. Now once again the reason our vendor network

uses all Leica, because they're surveying weather they're out there too and setting control. Not that you can't do it with other units, it just happens to be the process we prefer.

So we'll actually mark out an x, or set out a brass tag or a nail in a column or some type of feature. It just depends on the site, and then that way if we scan the job a year from now or two years from now, we have Survey Control and we can run a Traverse Loop to check.

Whoops. I don't need to show that anymore. So Autodesk ReCap is the first thing we're going to go through here. Where are we at in time? So we'll go ahead and do a start project. I'm just going to label this one AU Test One. Actually I might need to do two, just for safety's sake. I think I already did one.

So we're going to go ahead and select the file to bring into our project. Now this is our first. Let me show you. So it's the unified data set. So this is just all unified, you don't have the individual scan locations. I'm already assuming that you've gotten to this point. It'll be in the video series.

So we're going to bring this in there, and then you're just going to have to go into Launch Project. So you can see my data set in here. It's going to load here for a quick second, and I am running ReCap 3.1. A new version just came out yesterday. I decided, against my better judgment, not to download it.

That was just trying by too much fire, but there are a lot of new improvements in it. Give it a look see. I will be downloading it after this session and actually playing with it just to test it out. So one of the new features if you have not gotten 3.1 downloaded just because of this if you start doing this process is, by default you now have scanned region of unassigned points.

All points in your file go to the unassigned point region, so it just makes this process much easier. So as you can see I can hide it and then turn it back on. So we'll go back to Scan Regions. I'm going to dump a couple regions pretty quickly. We'll do the floor, roof, equipment, and then the wall.

I'm going to turn everything off. And the reason I want to do that is I don't want to put something on a region twice. So we'll go ahead and just turn those regions off. So as soon as I put a selection onto it, it just goes off. Think of it as a layer in CAD if you've never done this before. Same thing when you draw something on a layer that's off it just disappears right away.

Next step is go ahead and set your perspective or turn it off so it's an orthogonal view. So you

can see here I'm just looking at it orthogonal. Then I'm going to spin to the bottom here and just look at the floor. Change to a Plane Mode, do multiple picks across my plane, and that grabbed most of it. You can see I missed a little bit.

So I'm just going to hold down my Shift key on my keyboard, and you can see there's a little Plus icon next to my cursor so I can add additional Planer pick. And then I'll just do a double click to accept it, drop it onto the floor region, and it'll take a moment there to set that on there.

Now based on the time that we actually have here I'm not going to go through the whole process. It's detailed on YouTube, I've done the videos, I've done similar to this before at Autodesk and other conferences. But just for quick slaps and grins here I'll throw the equipment on the equipment region, and then just grab in between the columns there.

And then we just hover over the equipment, drop it into there, and then I'm just going to do a really quick Limit Box just to show you the beginnings of how this is going to help my transition here to Tony. So we'll do a Limit Box, edit that just to kind of knock out the roof deck for a moment. Confirm that. there we go.

And it didn't take it all the way down, but you can see there that I now have something that I can reference into, basically a 2D set of plans. Now I should do more clean up on this. I wouldn't call this good, but for the time frame that we have, you would just then go to the Home icon, click on Export, and then just say export this right here.

It's just the truss. It's the utilities. That's all we care about for our 2D plan and production.

TONY PAUPERT: Just wanted to add to that one thing. So I got too crazy with how he showed you, chopping it up a certain way. I tend to get a little overly detailed and I zoom in and I get a little-- he did it real raw. And that's actually ideal, because the more time you spend doing that the more time you're going to drag it out, sort of. It's just a down and dirty process.

So he's showing you not getting to the precise spot on the wall or anything like that. That's ideal actually. That's the way to go.

MARK LABELL: Yeah. And then to elaborate, when you do your export if you see that wheel spin too long, and what's the right sweet spot for that? Seven, eight seconds. One it spins longer than that, just export each of the regions on their own, and then just restart over that process with the master file that's not completely done and broken up. And once again, that'll be in the video, so I'll

have more detail on the video later to go over that process.

TONY PAUPERT: All right. I'm going to switch over to me. I apologize, I don't have the energy that Mark has. That's no coffee. That is no coffee.

MARK LABELL: That's the truth actually.

TONY PAUPERT: I'm working the best I can trying to get as much Coke in me possible, but I'm not going to have the energy that Mark has, but I'll try. So anyway, what I'm going to show you on this process here is taking what Mark has given in the scan data, chopped up, broken up. And the most express means to bring in a Revit so you can get going.

You're often going to here somebody's coming at you asking for this like, tomorrow. We need this, people got to start modeling now. So with that in mind you could ask Mark while he's doing his edits, getting to those details of those broken down areas, to give you just some kind of like raw, big chunk of the site-- it could be flat, whatever. You could just bring it in to start your setup while you're waiting for this process to take place.

So here in Revit we have actually this process where we go into-- oh, I'm in the wrong one. I'm sorry. Jumping ahead here. OK, so we have this process where we take the set up, and we'll go into a Overall View. Again, as Mark mentioned, these are going to come in at 1,000, 1,000, 100.

I don't maneuver or change anything with the coordinate system. I leave it as is. I don't adjust any of that. We make it as simple as possible. So what we start with though, is some automation that we have in place.

How to manage this data properly within Revit. You might say, oh my gosh, that's a lot of data. You know, think of what you saw Mark break up and now multiply it by 10 or 12. The data, loading all that, is going to be a drag. So the users need some control of what they can have on or off while they're modeling.

In that we use Work Sets. So you'd say Work Sets, that's a task to go in here and to create Work Sets, and then assign the point clouds to those Work Sets is a feat.

There's many hours there. So what we have in place is Dynamo Player. I love the Dynamo Player ready. 17.1. We have these two Dynamo Scripts that run here.

So what we do is first, you just, without any care you just point to the folder, and you go get your point clouds. In this case, I have it really small just for this example, but imagine this being at least 60 to 70 scans potentially with the area breakdown we have. And then we go ahead and bring them in origin to origin. And we bring them in, and you'll see them load.

Now I am loading solid-state drive so you can see the speed, as Mark mentioned, real quick. If this was over the network you would be waiting for it. So these, as you know, come pinned. And if I look at this, it just loaded it in on the Work Set that we have here by default, what I had loaded.

A part I will note, make sure that these are on existing so that they are properly displayed throughout all the models as you are in New Views. So if I take this now pay attention to the Work Set. If I run the first part of this Dynamo Player Script, which first part that I just ran creates the Work Sets for you. And it just looks at whatever you loaded in the model. And then the second part as you run it will actually assign the point cloud with the name that matched to the point to the Work Set.

AUDIENCE: [INAUDIBLE]

TONY PAUPERT: Yes it's reading the general files that I inserted into Revit.

AUDIENCE: [INAUDIBLE]

TONY PAUPERT: Yeah. However Mark broke them up, they just come in just like that. Yeah. So then the next very important part because we found over the years that if you don't pin these-- safety pin, whatever you want to call it-- you are playing with fire.

We've had a few people move these and then model to the moved point cloud and then somebody discovers this way late in the game, and it turns out we've got to move it, fix it, and wow, there was a lot of things modeled there. As you know, in Revit, it's easier probably to delete it and start over sometimes with how some of these things go.

So yeah, that's part of it. So we bring this in and now we have our point clouds. We do use a lot of Scope Boxes. So next step we set our Work Set to properly show the Scope Box.

So here we go. And I'm just going to get a general outline here. Nothing fancy. Name it Composite. Hopefully I spelled that right. Yeah.

And then for whatever reason I tend to just look at this, and they go invisible depending on the view. So I just peek at it to make sure I'm not trying an Easter egg hunt here.

And then once I have that it's to establish quickly the Scope Box always favors the bottom of that bottom layer level. So I just, kind of generous, I use like a 20 foot buffer. Get that clip out of there.

So I establish it, and I get what looks good for the site. Now I'm just using this little area to demonstrate this, but you'll go ahead and pin it. Because again you don't want that to move if you have that established for the entire project. You don't need the Dynamo anymore.

So then it's a matter of just go ahead and assign to those Scope Boxes any view that may relate. So in this case I'm doing my Elevation Views. So I also have level structure here to deal with. Now the levels themselves, there's a little bit to do here.

This is just common set up things, but this might be finished floor. And then this level two, so I pre-investigated using some drawings. I had existing drawings. And they indicate on those drawings that the bottom of truss is 18 feet off the ground, and we use 100 feet, as you know from what Mark said about the off-set.

So 118, and I'm going to just abbreviate that to the Bottom of Truss. And then I also investigated, and I happened to know that the roof is at-- I'll just play it for now-- roof and that is set at 124, 10-- average roof. So now we have some levels that we're also going to take and apply those Scope Boxes to.

Very quickly I now have a set-up that I can run with, and share with the teams, get people modeling, which is what we're trying to do in this event more so than anything. By the way, a little tip on the set-up, I purposely make these views when I'm setting up a point cloud to have the Cut Plane very far off just so I can, wherever they happen to come in, they'll show up for me.

And then I can take this Scope Box on this Setup View and also apply that to it. So that's my express set up for how we can just jump and run and get a project going. One thing I will mention, so you saw I put the point clouds in here and they are loaded as their own work sets.

So later I'll show you in the Discipline Model when we have a mechanical model-- new work-- that you'll want to unload these work sets as this is going to be some link in some model. You'll need to go and manage links and by default, turn those works that's off or they could load

multiple point clouds within the Revit session per link.

So that is that part. Any questions on the express set up?

OK. So we got the demolition process now. So this demo model that we are using a big part of it is all disciplines, all teams work within it to accomplish one big task, which is getting the demo properly orchestrated through this one model, this one area.

Big part of this also is using View Templates. View Templates are essential to make sure that everyone on the team is matching the same standard of quality and look and feel of the modeling elements. So we have embedded all the views, all the sections, all the 3D Views all have the same type of settings to make the look just the same.

So if I open up some of these views. So I have our demo, and here's a Demo View and I'll put up those here. So these are the views within. These views are very much set in a way to properly pick up the best look for the sheets themselves.

So if I go in to-- let's start with the mechanical. I'll go into the Area Four here. You'll notice on the Plan View side it has that look that you see in AutoCAD for many years-- color 252, whatever the default was for achieving like, a halftone look. And that is done by using a intensity. So there's this little hack trick of taking a point cloud, Color Mode Intensity, and taking all those point clouds, and then applying Intensity.

By default it's going to be RGB, but you can go to this gray-scale look. 100, 100, 100, is the look that we like, and it does a fair job. And then anything in the view that you don't want on by default you can turn off here. That's the beauty also of having the Works Sets. You're able to turn off or whatever you need on. You can group them by Work Set if that works too.

So looking at this now you can see what we have in here. We have built in hatch patterns as Mark mentioned that would export out and come into Navisworks later. This type of item is actually not anything really thrilling that you would find, but I find it exciting because you can now do this in Revit 2017 in the Floor View You can make a hatch pattern.

Sounds dumb. I'm excited about that, but the workflow before was dragging a drafting view on the sheet, putting a View Template on, View Port on, and then modeling every little hatch pattern through there because you can do it on Drafting View.

So this is more or less exciting on my end just as it removes a step. So we can go, you can see now it's a filled region you're able to do all that.

As far as settings go there is this one back here under Phases. This check box must be placed or you won't get the half-toning effect. Color is one part of it, but the half-toning is another. So we want to leave the half toning on, and then this is a bug you should be aware of.

If you apply a color here-- like, gray even-- to this right here, it's logged with Autodesk. It will turn your point cloud, instead of using these overrides, it'll turn it looking like a Skittle similar to what you saw out of ReCap when you assign the region. It takes on the region color in Revit for whatever reason, and that is just based on that color.

So that is pretty much Plan Views what we have special. As far as sections go there's a new feature in 2017 that we are utilizing, also a View Template. We use the same thing that we had for the-- where is it-- the Intensity Setting. All the Intensity Setting apply.

But when we go into the Depth Cueing, this is a new setting that actually will work with point clouds as well. People may think that this is just a architectural model thing. We're looking at a section you can get that to work. It works well with the point clouds.

The only part you need to be aware of, it only works on Coordination Discipline. If you set Mechanical or any other discipline it may alter the look of that product of the depth perception.

So some of this stuff is a little bit lighter, and the stuff that's in the forefront is darker. So it's kind of a cool way to get the view to look a little bit better. And then we got 3D Views. So the 3D View you see here, it's the whole area. I didn't break it up, but you can see the same thing with that intensity. And if you look at this and say, that looks like garbage, well you'll see what the PDF looks like.

Hang tight with this. This is a little rough looking, but the part that I want to make you aware of on the 3D View, and if I just go to a sheet. Here we go with what an actual sheet looks like with all these views on it, there's a hatch pattern.

Now see that flakiness? It's jumping around. That is a bug that I have no idea how to resolve it. It's more of an annoyance than anything. It doesn't hold me up, because I'm working between the views. So you see that hatch pattern there being separate. That is still a part that I can't get around. I need the Drafting View for it.

So you see here a Drafting View with nothing but hatch on it. That's a hack-ey workaround I have to do for the time being until it gets worked out, but all you do is you just right-click and you activate the view and model your stuff as you drag that Drafting View right on top.

So all of this is assembled on the same sheet. I also have an example of an architectural model where we went in ReCap, and we took ReCap Views that-- I guess you could just take a snapshot of a Real View. And right here, to make this part demo, this whole thing goes away.

We hatched it out. It's just a Drafting View in the model set here for view looking East, then there's a looking West. And if you look at the actual architectural model that's also hatched. And these markers are reference markers pointing back to that referencing here.

So if I go back into this architectural model you can see the referencing all works between the links so they can go in whatever view they need to be. But this is just another way to do it. There's a lot of options you have here when you're doing the demolition.

One part here I'm going to do really, really fast is the printing. So here is a printing output of it. And magic of television, just for time purposes, I do have one complete already. It'll probably process quick, but I don't trust it.

So as I mentioned the detail looks pretty nice when you zoom in. Very high resolution images, pictures stand out pretty well. And of course you note it up as much as needed using Keynotes or whatever. And then there's also the Mechanical Demolition Plan. Here is that 3D View I mentioned. It looks a lot better here, and also any other view you look at.

Pretty clean product. File size I will admit a little large, but it is what it is. Yes. Yeah, it's essential.

Another note, what you see here is a product of all things being Hidden Line visual style. If you ever do this, you can't see a point cloud, it's because you're probably on Wireframe. So be mindful of that when you're attempting this.

OK, and then the last thing here. So really quick, because I am out of time. I don't want to cut into Mark. You have your export. So whatever view you define-- this one I have in overall-- I'm just going to take all those markings that you see here and I'm going to export them out to DWG. And real quick just for time purposes, the export, wherever you dump it, it ends up being just an AutoCAD file.

You can give them a sheet, you can give them a view with the marks on it. And he's able to take it from there then. So thank you.

MARK LABELL: So magic TV again. There's that export. This is just in AutoCAD so one of the processes we do as part of that Demo Scope is Tony's now done the demo in Revit. We've released that to the contractor so they can actually do up their demo. We then now have to be mindful and chase that demolition package in our point clouds.

So the process that we've hammered out is taking the AutoCAD DWG, all of these come in as hatch patterns. You have to explode them. Navisworks doesn't read text that is with attributes. It's got to be [? dumb ?] text as well as doesn't bring in hatch patterns. You need to explode those down to [INAUDIBLE], so you do have to open up the DWG and do that step. And then you can bring that into Navisworks.

So here I am looking at my point cloud, and you can see much like what Tony was looking at there. This is my demo scope. Here's the hatch pattern around it, and I can review exactly what I need to remove. So this is part of the process of back checking.

So we'll export this using our custom plugin called that [? Navis ?] [? to ?] [? Point. ?] I'd be able to select my particular demo area, make sure the 2D lines are enabled, and then I can take this into my point cloud. So here we are, not going to do that process. But in ReCap presentation we're going to break through the broken-apart file, which is just the- It's like right in front of my face, I know it is. There it is.

This is the, in the last step [INAUDIBLE] truss space. So here is just the truss that Tony was looking at for demo. Once this imports then I'm going to bring in my export from [? Navis to ?] [? Points ?] which is the demo scope.

We'll take one quick process here and then I'll look at it what that file is. So the export of what [? Navis to Points ?] does is creates a text file much like ASCII text, like the old-school laser scanners use [INAUDIBLE] an x, y, z, in an RGB color value. So let me just look at this thing, crack it open. That's all it is. That's what the application's doing.

So back in ReCap, go into import, let's bring that text file in well. Demo scope, click Import File, an additional step that it's got to index the file because it is in a text-based file. It's not in RCS file format yet. So it's going ahead and doing that.

So once the loading's done here I'll be able to launch my project. Bingo. I now have demo and what made this easier, the first job that we showed this process on you still had to have a PDF on a designer screen on one side. They had to try and find where the pipe was contextually in ReCap and trace it down.

Not saying it's an inefficient process, it's possible. That's how we worked, but this made it a lot easier because I can contextually see my hatch pattern. I can once again change my view to perspective and look straight down the line of this particular piece of duct work. I can do pretty sloppy-- I'm going to grab this to say Clip out Side then I can try to [INAUDIBLE] a little bit better now just using my view [INAUDIBLE]

I can see there, that's right about it. There is round duct in transition. I'll do a clip outside again. I can spend time-- and I normally would spend time doing this if I have time allotted-- getting out all these pieces of steel here as well as this fire protection pipe. I know it's fire protection because I can tell about the red scan.

And then what I'll do is I'll just turn the demo scan off, so now I don't see the demo. So if I'm happy with this I'll just go ahead and select that particular demo piece, throw it on a region called demo, turn demo off, and then let's say if that was the only thing hypothetically I had to remove in this project, then I would export what you see right here as its own file called existing to remain.

I would then turn that off using the unassigned point region, turn the demo on, export the demo as its own point cloud because clients do change their mind. Just because they want to demo it today doesn't mean they actually demo it. Pro tip.

So you can put this back into your Coordination file later on if you need to. We've done it before a lot. Money gets tight and they're just leave it in space sometimes.

So as you can see there, ReCap, we've done the demo process, and then we're going to hand that back over to Tony. I'll kind of show you just quickly before we switch it over. The final file that we'll be looking at from here on is called this ETR, Existing to Remain. So all the demo scope is no longer in it.

And now Tony's going to show how to do the rest of our kind of workflow in 3D, and then we'll coordinate back into Navisworks to show the final buttoned-up product here.

TONY PAUPERT: OK, there's a lot of handing off between products here, but we've got a good thing once the

data comes back, as he mentioned, the Existing to Remain.

There is some minor touch-up every now and then that may occur, and that can be done with just generating, as he just did, locate the area and produce a new export of that view. You've just got to get users out of the model. If they're touching it, it would require people to get out and allow the file to be overwritten.

Here we go. I'll know first as I mentioned with the managed links, this is a big one. You will get tremendous lag, and it will be a very noticeable thing. If you don't go into the Disciplines Models that have these things linked in and turn those off by default. You want to say, no. Make those go away.

If you leave these to say yes you could have three, four, however many point cloud versions of the same exact file load in the same exact spot. So that's the one thing you just need to be mindful of when you do it in this way. It's just planning.

The Working Views. So we have a few starting views here developed. I show, in this version, just representing Fire and HVAC. If I go into an HVAC plan you can see all the new work that has been modeled with the point cloud background showing just right.

Now part of the trick involved in this is to find the sweet spot to where you want to show the cut plane to get the information showing properly with all of the point cloud information. And that's usually done by just looking around and messing with the View Range. So here we have, in this example, the View Range set.

24 feet offset. 22 is the cut, and then you got four for the bottom. That's good for this particular view. Another view that we have in here is a Fire Protection View. Now you look at this one and we have some existing pipes. So we don't do the Scan to BIM, but we do capture where it makes sense to draw an existing pipe and also have it on the existing phase.

That is acceptable. That should happen. Drawing in the existing line, just a little bit of it, where you're showing it breaking into a new system. So this part here was modeled as a new fire protection system run connecting back into the existing, because something right here in the new construction, we need to bypass that.

So the trick to it is to be mindful, and always, always, always have that point cloud open with all the discipline models lined in together. Easier said than done. A lot of people don't do it, but

here we have a working HVAC plan. Actually the fire protection one is the one I wanted. And then put these two side-by-side.

This is what we tell modelers a lot. When we do something in plan, definitely all eyes should be on the 3D View as you're modeling it. So here I have an example of this little area where there's duct work dropping down. This is a brand new unit installed on the roof. And you can see the steel. All new items from other disciplines are here to account for, and in this case, the modeler did a very good job of coordinating even missing insulation.

There's a spot here where they're sneaking in through, or is that another area. Pretty sure I saw it.

But being aware of what's around and using that point cloud to help navigate is just essential when doing this modeling. So this is going to eliminate RFIs, it's going to keep everything as it should. We're doing good on time? OK.

OK, so I'll just show you another area here, just drag this out a little bit. I think this was the spot I was mentioning. Maybe not, but it's all coordinated nicely. And those elements are shown as new.

Now part of what I was mentioning about some fact finding. So if you happen to see that the demolition-- maybe they did a bad job of demo-ing it-- you can export out only the new elements. So I have this workflow where you can isolate only the new work. I had it as a 3D View. Here we go.

Isolate only the 3D work that was modeled, and you can do that with just the filter. Just say show new with new construction. Export this out to AutoCAD and then you can bring that into Navis and it shows up.

And same process using [? Navis ?] to [? Points. ?] Export these out and these can go into ReCap, and you can then see it, turn it on or off, and then adjust and trim the point clouds as needed. So that's part of the 3D [INAUDIBLE]

AUDIENCE: [INAUDIBLE]

TONY PAUPERT: It's like that right now. It's like that right now.

MARK LABELL: No, you misspoke actually. No, we go directly to Navis. For the demo work, yes.

TONY PAUPERT: Well this check, is he talking about the check?

MARK LABELL: Yes. You would be able to take that as an NWC into Navis.

TONY PAUPERT: Correct, correct. But I actually have that right now.

AUDIENCE: [INAUDIBLE]

MARK LABELL: Only for the hatch piece, only for the demo.

TONY PAUPERT: Right, OK.

MARK LABELL: Because you have to explode it, because when it does that you can't take 2D flat elements into Navisworks and Revit.

TONY PAUPERT: OK, and so on the sheet side of this, here's an example of just point clouds again showing up, used to depict what's there existing all with that intensity applied. 100, 100, 100.

And then it's doing that glitchyness again. I just can't help that. But again, it will print just fine. I think I have a copy of that here.

Yeah, so you can note it up as needed. New connection points, that sort of thing. And you can see the quality is pretty clear. It is all in how you adjust though your View Range. So if I go into this, and I look at that View Range here, it's controlled by the View Template.

So in this particular model-- and you do a little fact finding by going in sections and messing around to find the right elevations-- but this one the cut plane made sense at 23:3 to better display the sprinkler system.

I don't have-- I'm sorry, I apologize about this-- I don't have the Navis exporter here, but the next step of this would be to export to Navis the information out using what we have in here as-- we've got an area kind of hidden away from people. It keeps people playing nice.

We have this whole group of views and sheets hidden away from all the users, and within it we have this Navisworks view that this information here then gets exported it out to NWC and then that's where it goes to Mark.

MARK LABELL: So last couple things we'll talk about here. So the view that you see here-- I forgot to mention it

in the last step-- is our kind of our QC back check. I showed what it looks like to be demolished in the color, but we also will colorize the systems just to give a little more context to people as well. So that you can see here the mechanical duct work piping is purple or pink, sprinklers are red, and electrical scope is under the green.

And you can see the different new design look in there as well. So one thing we'll mention as you can see this 400,000 square feet, that was how fast everything loads off of a solid-state so they are legit. I am running off of an M.2.

So they are a lot faster than even the traditional solid-states that we were showing. So one kind of mind thing that we want to show there. So just to kind of wrap up where Tony was going is here is his design. And you can see that the demo point clouds are showing up with everything removed. And I can show that here with-- if I just come back into my selection tree and I go ahead and show you the truss space, which was prior to demolition and then I hide my one that's called truss area to be removed-- you can see, if I start following some of this duct work over here, these mains shouldn't be here.

So if I turn that off you'll see that those remove. So that's the whole point of this process. So if you go into our Clash Detective, circling back to what we discussed again, one thing that we've done at SSOE is-- a lot of people have done this over the years, including us as we always used to do Clash Detection, discipline versus discipline, [? arch ?] versus struct, arch versus mechanical, arch versus fire protection. Blah, blah, blah.

And that was the only way to really spend time on knowing who should move. We've changed that process. I'm not going to go into all the reasons why, but we did a lot of number crunching, a lot of fact finding and we've just went to two sets. I have a third one here just to show you the difference, but really we do point cloud versus new, and everything new designed versus new.

The tools are there. If you use search sets to their power you should be able to figure out how to filter. And you can see here based on our sets criteria, we have everything set up for existing versus new as well as down to the discipline and piping level. So supplier, exhaust air, and this is within our normal templates.

So spend a little time getting your templates right when it comes to sets. You don't have to have all the crazy detection, Clash Detective rules. So we do new versus new, like I said, and then we do post-demo versus new, or the point clouds. And the reason, once again, coming

back to where we were, that 50% false clash reduction, this test, I'm just showing you that as an idea. 1,900 clashes.

If we didn't go through and do that demo process, even though we released drawings for demo contract showing in Revit with the point clouds, if we didn't go back and chase the demo in ReCap, we would have to chase our tail and find those 1,100 clashes and approve them.

Or we'll just take blind faith and send it off to the contractor, and hope they don't put us to the wall as an engineering company and saying, why didn't you get this-- everybody hates the term zero-clash, but as close to zero as possible.

So that's a big thing, to show that process is a huge time saver. So once again demo versus new, and new versus new, we'll go ahead and set up a bunch of rules inside of Clash Detective. These are only a few of our rules, but remove insulation, you know, because we know that that insulation can bend around particular point clouds. If you have a pipe that's wrapped in insulation and that pipe hits a point cloud you don't need to have the insulation also reporting. So we'll set up all kinds of different intelligent rule systems in there as well.

So in closing that's really our workflow from A to B in 40 minutes. It takes a lot longer than that in the real world, but we try to condense as much material as possible for you all. Hopefully we gave you a bunch of different examples and maybe different ways to think about how to do point clouds in your next project, and not hopefully have to spend time converting everything on your projects.

So with that closing any questions? All the way in the back first.

AUDIENCE: [INAUDIBLE]

MARK LABELL: Yeah. Yeah.

AUDIENCE: [INAUDIBLE]

MARK LABELL: We rotate to a column line. So if we set, let's say A-1, for example, is 1,000, 1,000. We told them to survey and hold the column line. So they'll best fit that, because not every column line is going to be perfect within an 1/8 inch so they'll survey a row of columns and then they'll swing that as part of their process. Or a vendor will do that.

AUDIENCE: [INAUDIBLE]

MARK LABELL: No.

TONY PAUPERT: No.

MARK LABELL: No.

TONY PAUPERT: Just drop them in as you saw.

MARK LABELL: Yeah, the vendor sets the coordinates, so real building is tilted like this. They set this, this is your column line, right? We tell him to measure that column line and set that as North. And they rotate it in their Cyclone or Scene or whatever their product that they do that in.

And they rotate the actual point cloud to building North so when we put it in Plant, Revit, whatever, drops right in perfect. Like I said, do not rotate in your CAD platform.

AUDIENCE: [INAUDIBLE]

MARK LABELL: In case you receive it like that? Have a good relationship with a vendor that can hook you up, or know how to use the software to do that too. You can do it ReCap, it's a lot trickier. I can tell you that from personal experience. Cyclone and Scene?

Yes, they're very tough projects to learn how to use products, but once you start doing more scanning I would suggest going to them to understand how to do some of those rotational methods because they are, let's call it the gold standard still. Other questions.

AUDIENCE: So you mentioned you have a monuments set for your origin point. If you have to work with, say, a secondary consultant form that is using a different platform, do you guys ever run into issues where that origin point, if they move the scan and you don't move the scan, how do you hold a separate [? consultant ?] accountable to maintaining that position?

MARK LABELL: The tough part is it depends on your contract. I mean it does. So if we're on a job where we're the CM we had in our contract that we set it, you follow it. If you don't follow it, that's your problem and you're figuring it out. We're not helping you.

Now there are other jobs, I can tell you, that we're hired on by a GC and, you know, everybody's got their role. And we try to mindfully set that up ahead of time and let them know if they're working in like in Plant 3D and we're working Revit. But yes, sometimes it does fall

through the cracks, because if we're not in the seat, you know, driver's seat to be able to drive it, it does happen.

I can tell you it's not a perfect world yet. So it just depends on who's coordinating it in Navisworks too. The GC's still going to do it, and they're going to have to spend time modeling it and moving it. That's why we try to say, set it in the point cloud. That way it just drops right in.

Other questions? I thought I saw a hand somewhere. No? One more.

AUDIENCE: [INAUDIBLE]

TONY PAUPERT: How do you set it? I mean we just leave it where it is. They're preset.

AUDIENCE: You mentioned before that you put [INAUDIBLE]

TONY PAUPERT: Oh, yeah.

AUDIENCE: So when you scan it, it scans in so you know where it is or something?

MARK LABELL: Yeah. OK. I think I understand your question a little bit better. So survey control, I mean if you set a benchmark-- the reason I have so much love for survey, I used to work at surveying before I came to SSOE. So you'll set your benchmark, and they're going to document that in the scan.

What we do in ReCap is we actually will tag that as what the benchmark is. That was the actual assumed benchmark if they set that control. Now if they set something at 1,000, 1,000, 100 arbitrarily we'll just document that somewhere else and we'll put a note in ReCap.

But to Tony's point in Revit, same thing in Plant, it drops in in the right spot. It just drops in. You don't have to monkey with any of that crazy Revit madness that I don't even understand, because there's just 46 different survey points.

TONY PAUPERT: We just you overcomplicate it by even moving it to begin with. It's the original origin point and it serves no purpose to move it other than complicate and confuse. So keep it simple.

AUDIENCE: I've been there.

MARK LABELL: Any other questions? Or else we let you out two minutes early.

AUDIENCE: Is the Navis plug in tools [? any worse? ?]

MARK LABELL: Yes.

AUDIENCE: [INAUDIBLE]

MARK LABELL: Yeah, we did develop all those internally.

TONY PAUPERT: The man's right there. He's trying to hide.

AUDIENCE: [APPLAUSE]

MARK LABELL: Thank you.

TONY PAUPERT: Thank you.